RF Exposure Analysis – SAR Test Exemption – Prism 2 Transmitter

FCC ID: 2AKCM-57136

The Prism 2 is a wrist worn device that contains transmitters in the 2.4GHz band (LE Bluetooth) and 900MHz ISM band (LoRaWAN).

The transmitters do not operate simultaneously.

The following FCC Rule Parts are applicable:

Part 2.1093 – Radiofrequency radiation exposure evaluation: portable devices

Part 1.1307(b)(3)(i)(C) - SAR test exemption (ii)

Part 1.1307(b)(3)(i)(B) - SAR test exemption (iii)

For model the Prism 2

Operating Frequency: 2402 – 2480MHz

Tx Power: +3.0dBm max. conducted

Antenna gain -1.5dBi

Operating Frequency: 902 – 928MHz

Tx Power: +3.0dBm max. conducted

Antenna gain -17dBi

Minimum separation distance (R) = 5mm (0.005m)

Evaluation

From Part 2.1093(c)(1). RF exemption applies if the maximum transmitted power is less than the maximum of the following three criteria:

i) Less than 1 mw Blanket exemption. $P_{TH} = 0.001$ W – (Prism V2 not compliant)

ii) determination of exemption under the MPE-based §1.1307(b)(3)(i)(C), if i) not met

iii) determination of exemption under the SAR-based §1.1307(b)(3)(i)(B) if both i) and ii) are not met;

Determination of threshold power (P_{TH}) under the MPE-based §1.1307(b)(3)(i)(C)

This is only applicable at a separation distance greater than $\lambda/2\pi$

For Prism 2.1:

2.4 GHz operation - $\lambda/2\pi = 0.02$m

0.9GHz operation - $\lambda/2\pi = 0.053$m

The Prism 2.1 separation distance equals 0.005m therefore this clause is not applicable.

Determination of threshold power (P_{TH}) under §1.1307(b)(3)(i)(B) as the transmitter power threshold for SAR test exemption:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

d = the separation distance (cm);

For Prism 2 @ 2.4GHz Operation:

From §1.1307(b)(3)(B) :

$ERP_{20\ cm} = 3060$ mW

$x = -\log_{10}(60/(3060\sqrt{2.4}))$
$= -\log_{10}(0.0127) = 1.9$

Threshold Power $P_{th(1)} = ERP_{20\,cm}(d/20\,cm)^x$
$= 3060\,(0.5/20)^{1.9}$

$= 2.76mW\ (4.4dBm)$
(Pth = tx power ERP or conducted time averaged, whichever is greater)

The Prism 2 max. transmitter power @ 2402MHz = +3dBm conduced (< 4.4dBm $P_{th(1)}$), so the Prism 2 is therefore exempt from evaluation.

For Prism 2 @ 0.9GHz Operation:

From §1.1307(b)(3)(B) :

$ERP_{20\,cm} = 2040f = 2040x0.902 = 1840$

$x = -\log_{10}(60/(1840\sqrt{0.902})) = 0.034$
$= -\log_{10}(0.034) = 1.47$

Threshold Power $P_{th(2)} = ERP_{20\,cm}(d/20\,cm)^x$
$= 1840\,(0.5/20)^{1.47}$

$= 8.12mW\ (9.1dBm)$
(Pth = tx power ERP or conducted time averaged, whichever is greater)

The Prism 2 max. transmitter power @ 902MHz = +3dBm conduced (< 9.1dBm $P_{th(2)}$) so the Prism 2 is therefore exempt from evaluation.